



# EasySolder

Version 1.3 (Januar 1999)

## User's Manual

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# Introduction

LPKF *EasySolder* is a process for the production of PCB prototypes by means of which a previously milled solder mask can be glued permanently onto a board. This facilitates the soldering process especially for PCBs with SMT assembly / assembled components. The LPKF MiniPress needed for this process can handle boards up to the size of 180 x 120 mm.

## Conditions

To be able to use the LPKF *EasySolder* process you need a reflow-oven,

- which can be heated up to **175°C** and
- which has a minimum internal space of **140 x 350 x 250 mm** (H x W x D).

## Scope of delivery

Check if the delivered goods are complete. The scope of delivery comprises:

- 1 x LPKF *MiniPress*
- 1 x Torque wrench, complete
- 1 x Socket ½“ 19mm
- 2 x Pressing metal sheet DIN A4
- 10 x Pressing cardboard cushion DIN A4
- 10 x Solder mask DIN A4
- 2 x Press sheet DIN A4
- 4 x Drill underlay material DIN A4
- 3 x Micro Cutter
- 1 x Glue stick
- 1 x Tape
- 1 x Pair of working gloves
- 1 x Configuration disk for LPKF *CircuitCAM*
- 1 x Scalpel
- 1 x Scalpel knife
- 1 x This user manual

## Technical Data

### LPKF *MiniPress*

dimensions:	140 x 350 x 250mm (H x W x D)
weight:	16kg
max. pressing surface:	180 x 120mm

### Solder mask

material:	Polyimide
glue:	Acrylic, flame-retarding

**Note:** The solder mask is provided with a flame-retarding acrylic glue. The flame proofing agent does not contain poly-brominated diphenyls. Therefore a fire will not cause toxic or aggressive gases.

The solder mask can withstand a solder bath temperature of 288°C for 5 minutes.  
The electrical characteristics comply with the IPC requirements.

## Procedure

### Preparing the Gerber data in *CircuitCAM*

#### CircuitCAM 2.x

On the disk contained in the delivery you will find insulating and output jobs prepared for the generation of milling data for the *solder mask* as well as the corresponding format reference for *CircuitCAM*.

*SolderMaskCut* (UserInsulate)

*SolderMaskOut* (UserDataOutput)

*SolderMaskTool* (UserDataFormat)

In menu FILE select function MIX SCRIPT, in order to open the file „mask.scr“ on the disk and to load the jobs *SolderMaskCut* and *SolderMaskOut* as well as the format reference *SolderMaskTool*.

The insulating job *SolderMaskCut* expects the two layers *SolderMaskSold* and *SolderMaskComp*. Therefore allocate the corresponding Gerber files to these layers when reading in the production data.

During aperture definition take care that the pads to be milled do not increase in size by the diameter of the milling cutter when this tool is used.

Use the job *SolderMaskOut* for the handing over to *BoardMaster*.

#### CircuitCAM 3.0

Copy template file *EasySolder.cat* from the supplied disk to the *New\_Templates* folder.

Start *CircuitCAM* and open the format template *Easysolder.cat* with the NEW submenu from the FILE menu.

Import the solder mask files (Gerber) using FILE; IMPORT, OPEN; where either *SolderMaskTop* or *SolderMaskBottom* is indicated for the layer.

For the isolation (EDIT, INSULATE, JOB) the jobs *InsulateDefaultTop* and *InsulateDefaultBottom* are used. The corresponding button can also be found in the PROTOTYPING toolbar.



Isolate component side



Isolate solder side

To export data, select *LPKFCircuitBoardPlotter* from the EXPORT submenu of the FILE menu. The file created will be saved to the working subfolder under the same name as the CircuitCAM file, but with the file extension *.LMD*. The corresponding button can be found in the toolbar PROTOTYPING.



Export LPKFCircuitBoardPlotter

## Preparing the solder mask for milling

1. Cut the solder mask to the appropriate size so that it is by 10 mm bigger at each side than the PCB layout.
2. Use the two drill underlay material materials for milling in order to avoid damaging the milling tool!
3. Please check whether the solder mask is covered with a protective film. If it is, then remove the film.
4. Place the solder mask with its mat side downwards onto the two drill underlay materials.
5. Fix the solder mask with the tape contained in the delivery.  
When fixing the film, make sure that the solder mask covers the board flat and even.

### Note for milling the circuit board

Make sure that at each side the PCB basis material size is by 10 mm bigger than the layout to be milled so that the solder mask can be fixed on the PCB more easily.

## Milling the solder mask with *BoardMaster*

### Settings:

Tool:	Unimill100 micro-milling tool
Tool diameter:	0.15mm
R.P.M.:	40.000 (20.000) min <sup>-1</sup>
Speed:	10 (5) mm/s

Values in brackets apply for circuit board plotter with DC motor!

1. Adjust the milling depth on that part of the solder film border area which is not used:  
With the motor switched on you should mill a rectangle of 2x2 mm by means of the traverse keys in *BoardMaster*.
2. Switch on the vacuum system.
3. Start the milling process using the data prepared by *CircuitCAM*.
4. At the end of the milling process check whether all pads have been cut out. If this is not the case, start the milling process again.

## Prepare the finished milled board

Clean and grind the board as described in the manual for the circuit board plotter in order to achieve the correct adhesion of the solder mask to the board.

You should clean the board again with a solvent even shortly before the pressing process.

## Prepare the Press sheet

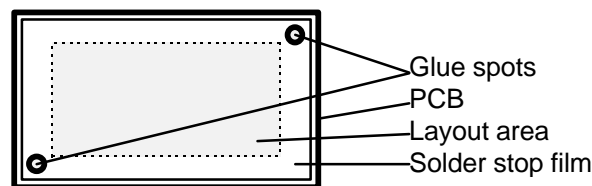
Use a pair of scissors to cut the PRESS SHEET to the size of the PCB to keep the material used as small as possible. After the pressing process the press sheet can be reused around 10x.

## Prepare the solder mask

Before the pressing process pre-dry the solder mask in an hot air oven for 10 minutes and at 100 °C.

## Fix the solder mask on the PCB

To keep the solder mask in place on the board we recommend to fix it by using glue to put two small glue spots on the board.



Make sure that the glue spots are outside of the layout area!

## Assemble the press

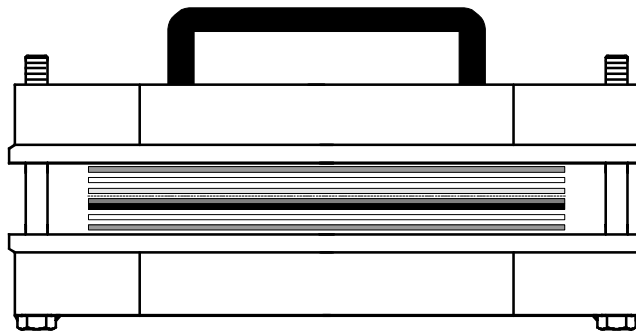
For assembling the press with the PCB loosen the four clamping nuts and pull the top of the press off using the handle.

Put the following objects one after another and centered on the pressing surface of the bottom part:

1. the pressing cardboard cushion for the bottom part
2. the pressing metal sheet for the bottom part
3. **for double-sided assembled boards:**  
the press sheet for the bottom of the PCB
4. the PCB with the solder mask(s)
5. the press sheet for the top of the PCB
6. the pressing metal sheet for the top part
7. the pressing cardboard cushion for the top

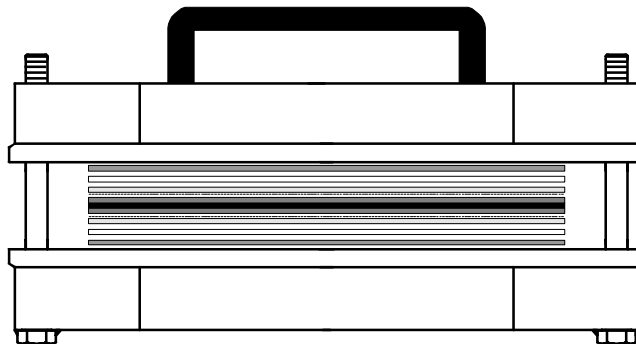


Now put the top part of the press again on the bottom part. The LPKF MiniPress should now be assembled as follows:



Pressing cardboard cushion  
Pressing metal sheet  
Press sheet  
PCB with solder mask  
Pressing metal sheet  
Pressing cardboard cushion

*one-sided assembled board:*

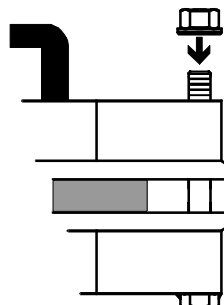


Pressing cardboard cushion  
Pressing metal sheet  
Press sheet  
PCB with solder mask  
Press sheet  
Pressing metal sheet  
Pressing cardboard cushion

*double-sided assembled board:*

## Adjust the pressing pressure

To do this, screw the four nuts on the threaded bolts..



In order to generate the necessary pressing pressure for the solder mask to be glued on screw the four nuts tight and crosswise until the corresponding clamping torque is reached according to the following table:

Clamping torque per screw	PCB size
29Nm	180 x 120mm
22Nm	160 x 100mm
13Nm	100 x 100mm

You can use the following formula for determining the clamping torque for PCB sizes not stated in the table:

$$\text{Clamping torque per screw} = 0.00135 \cdot \text{PCB size}$$

**Note:** The clamping torques as explained above are corresponding to a pressing pressure of approx. 250 N / cm<sup>2</sup>.

## Hardening in the oven

In addition to pressure an increased temperature is needed for hardening the glue on the solder mask.

Put the press for a period of 2 hours into a reflow-oven.

Temperature: 175°C, do not pre-heat!

Please note that the period of two hours ( heating up and reaching the temperature within the press ) relates to the heating in a reflow-oven.

Other periods of time may result when using a different oven.

## Cooling down

Let the press cool down in the opened reflow-oven.



### Attention, Danger of Burns !

Make sure that the press is cooled down before taking it out of the reflow-oven and opening it. Use the gloves supplied with the delivery for taking the press out of the oven!

The gluing process is now finished.

## Production Procedure LPKF AutoContac combined with LPKF EasySolder

The solder mask process **LPKF EasySolder** can also be used in combination with the through-plating process **LPKF AutoContac**.

**The procedure is as follows:**

- Before through-plating the board, put the solder mask onto the board by means of the pressing process.
- Allow the circuit board which is now provided with the solder mask to cool down and then clean it thoroughly using a solvent.
- Then proceed with the through-plating process with **LPKF AutoContac** in the way described in the **LPKF AutoContac** manual.
- Finish all through-platings and harden the board in the oven. When the board has cooled down, apply a solder resin in order to improve the solderability.

**\* Note when using LPKF MiniPress:**

*There must be alignment holes available as the board will be machined on the circuit board plotter after the pressing process.*

*Reduce the distance of the pilot pins of the circuit board plotter according to the working area of the **LPKF MiniPress**.*

*There are no limitations for the application of the solder mask when the **LPKF MultiPress** is being used, i.e. it is possible to use the A4 basis material with the normal distance for alignment holes.*

## Consumable materials

The following consumable materials can be ordered from LPKF::

Item	Quantity	Order number
Solder mask DIN A 4	10	104178
Press sheet DIN A 4	1	106084
Pressing metal sheet DIN A 4	1	104421
Pressing cardboard cushion DIN A 4	10	104420
Drill underlay material DIN A 4	1	101051
Micro cutter 3mm shank	1	100889
Micro cutter 1/8" shank	1	100890
Scalpel knife	1	104441

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